

Macroeconomics equilibrium structure  
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### 1. Abstract

It proposes an alternative theory to explain macroeconomics equilibrium for a multi-sector economic period. It includes a brief derivation, numerical examples of closed and open economies (Appendix I), preliminar statistics of some national accounts data (Appendix II), a 2-Sectors Cash Flow Analysis (Appendix III), and short comments. Based on Marx's concepts of surplus and exploitation, it does not use Labor Value Theory and only applies market prices to input-output global or national accounts. Main conclusions are:

- 1) Input-Output National Income Profit Accounts (IO-Nipas) portray an inner equilibrium in period flows -not reflected in standard Nipas because they do not add exports to internal final production -.
- 2) Such balance depends on parameter "a", or period average markup, that ranges between 1 and 2 in the average but not necessarily in particular sectors, and is a function only of average surplus-rate.
- 3) Real market prices are considered the only functional and available expressions of value needed to measure flows, exchanges and aggregates, independently of the employed concept of value. Valuations of capitals or costs not transacted in the period market are not considered here, because they are not part of period flows.
- 4) Model relates microeconomic sectors with macroeconomic aggregates after a past period, and derives expressions for total transacted, total value-added, rates of profit, absolute surplus rates, and average markup factor.
- 5) Model can not predict, it only seeks to explain past economic periods. It might be used as a guide to orient economic policies and eventually, to set limits that dynamic models should fulfill.

### 2. Antecedents and Objective

Marx tried to explain intersector macroeconomics from imaginary examples of 2 or 3-sectors economies, based on Quesnay Tables. Those examples were qualified -by many people, and with good reasons- as outside of real economies, or simply self-contradictory. This century is also plenty of similar cases.

However there is a valid question behind the point: What are the conditions that permit to propose an imaginary example so it keeps analogy with real economies? Answering it is the same as to explain inner macroeconomics relations. This paper is an attempt toward that goal, from an heterodox view, based on Marx concept of surplus and exploitation, but not in his LVT (labor value theory). It only employes market prices, it has been preliminary tested with succes to input-output national accounts of Colombia, Mexico and Spain, in spite of the flaws of this accounting method.

### 3. National Accounts and Equilibrium

Here, Say's equilibrium is accepted in the following sense: even though productive and economic life change everyday, there is an internal balance in the final accounts of a long period that express the 'average dynamics' during it. It is like a byke cyclist in a one year trip: sometimes velocity is slow or fast, othertimes is zero, othertimes he rides backwards, etc, but after aggregating all this, we may determine the total net vector of his annual movement, and average speed. In other words, equilibrium in period balance does not exclude disequilibrium moments that accompany change. This is part

of real life of firms whose accounting balances do not imply equal structures in all months, nor in different sectors, departments or products.

#### 4. Theory Applied - Short demonstration

In any firm or sector with subindex "i" let's call the following variables:  
Ci = (Non-labor costs or flow of capital costs transferred to the product).  
Vi = (Variable capital or Labor costs paid to workers)  
Qi = Ci+Vi (Total Cost for producer)  
Ti = Ci + Vi + Si (Transactions, or sells for producer)  
Si = Ti-Qi (Surplus obtained by proprietors, or profit).  
Ai = Vi + Si (Aggregated value, created only by human activity).  
When all sectors are aggregated we use the same letters without subindex.

In national accounts, the following additions take place:  
Zigma(Ai) = A (Total of aggregated-values)...A=S+V  
Zigma(Ti) = T (Total of transactions).....T=C+S+V  
Zigma(Qi) = Q (Total of costs) .....Q=C+V  
V, S, C express the net addition of particular components.

Here comes the hardest premise: At national context, the total cost equals the total of value-added, because the same currency that pays costs is used later to pay the product represented by its Value-added (See Appendix III for a 2 sector case argumentation). This deserves further discussion, but not here -just assume it for the moment-. So:

Q = A                    then C+V = V+S                    so:  
C = S                    (It says that total non-labor costs equals total surplus!!)  
T = C + V + S           so, T = S + V + S (Given that A = V+S):  
T = S + A                (Dividing by A, and calling a=T/A):  
a = S/A + 1  
S = (a-1).A              [1] From it we can derive other relations:  
V = (2-a).A              [2] Total labor as function of "a" and A.  
T = a.A                   [3] Total transactions or T.  
p=S/V = (a-1)/(2-a)      [4] p=Surplus rate.  
a = (2p+1)/(p+1)          [5] "a" as function of "p", 1<= a <=2  
If we define the rate of profit as r = S/(C+V) then  
r = S/A                  [6] we get:  
r = a-1                  [7] Replace [5] in [7] and you will get [6]

NOTE: "a" is the average markup factor, a=T/A, or a=T/Q during period.  
This seven equations resume the alternative theory proposed, based in aggregations of real prices. It is a marxist hybrid system. Now let's see an 'imaginary example' taken from a publication of United Nations (1956).[1]

5. Example from UN Input-Output Table (1956):

This is a 3 sectors economy: agriculture, industry, services:

A.....	B...	C...	D..	E.....
.....	AGR.	IND..	SER	TOTAL
1. AGRICOLE INPUTS TO..	5...	30...	0..	35
2. INDUSTRY INPUTS TO..	10...	40...	5..	55
3. SERVICE INPUTS TO...	10...	10...	10..	30
Q=Costs:				
4. C=Interm.Cons=1+2+3.	25...	80...	15..	120
5. V = LABOR.....	40...	40...	75..	155
6. Q = COSTS= 4+5.....	65...	120..	90..	275

S=Surplus:

7. INTERESTS.....	5...	5...	10..	20
8. CAPITAL RENTS.....	15...	5...	5..	25
9. PROFITS.....	15...	20...	40..	75
10 S=Surplus=7+8+9.....	35...	30...	55..	120
A= Value-added				
11. ValueAdded=10+5....	75...	70...	130.	275
T = Total of Transactions				
12. T=11+4=10+5+4.....	100..	150..	145.	395

Table 2: SUMMARY

A.....	B....	C....	D.....	E
.....	AGRIC.	INDUS.	SERVI.	TOTAL
4. C =INTERMEDIATE.CONSUMPTION..	25....	80....	15....	120
5. V = LABOR.....	40....	40....	75....	155
6. Q = COSTS= C+V=4+5.....	65....	120...	90....	275
10. S = SURPLUS.....	35....	30....	55....	120
11. A = ADD.VALUE=S+V=10+5....	75....	70....	130...	275
12. T= Transactions=A+C=4+11..	100...	150...	145...	395

Let's check:

a. Total cost Q = Total Added Value A      [E6]=[E11] =275

b. Total C = Total S      [E4]=[E10] =120

Now, please take a calculator and check the following:

a. Parameter 'a'=T/A      [3]      [E12] / [E11] = 395/275 = 1.436363636

b. Surplus rate from

$$p=(a-1)/(2-a)=(1.436363636-1)/(2-1.436363636)=.774193548$$

c. Surplus rate from  $p=S/V=$       [E10] / [E5]= 120/155 = .774193548

d. Total surplus from  $S = (a-1).A = (1.436363636-1) \times 275 = 120$

e. Total labor from  $V = (2-a).A = (2 - 1.436363636) \times 275 = 155$

f. T from  $T = 2S + V = 155 + (2 \times 120) =395$

## 6.0 Comments

6.1 Previous calculations express the equilibrium relationships of a balanced economy in price markets without LVT, without productive-unproductive labor considerations, without value-price conversion problems, without matrix inversions, where sectors may have different surplus-rates, technical compositions and profit rates.

6.2 Examples of global economies, even of two sectors, should not be created by random procedures because they normally do not conduce to a valid example. This was not known by Marx, nor by many great economists of XX century: we can not blame on them.

6.3 Situation gets worse if we deny Say's supply-demand equilibrium, or when we add strange premises for mathematical convenience to solve our equations without checking them out with real data. Given that our  $Q=A$  premise may be considered such an strange and arbitrary premise, it is imperative to test it from past reliable IO-Nipas. (Appendix II and III).

6.4 It is clear that the input-output Leontief national account example is presented in a modified shape, which is suggested to introduce changes in input-output-NIPA's standards.

Standard IO-Nipas handle exports outside the production side, but the value of C and V are for the whole production. Exports must be added to internal surplus to get total surplus, and to internal Value-added to get total Value-Added, because they are part of final production. See Appendix I.

6.5 There are other matching examples with real NIPAs, but they carry on several minor complexities to be avoided at this point.

6.6 Under this model, monetary equations become different to mainstream ones.

6.7 Also, prices depend upon salaries and the parameter "a", or markup factor. This is the equivalent to say that they depend on labor-hours, wage per hour, and the average surplus rate, a result consistent with Marx view, but explained in a different way.

6.8 If this theory has "scientific merit" it might bring hard consequences on several schools of economics.

6.9 The model is ex-post-facto. It can not predict, only explain.

6.10 Model questions concepts of equilibrium like: long-term (Keynes), static equilibrium (Walras-Pareto-..), or the equilibrium of prices oscilating around some equilibrium converging price (Ricardo, Marx). In its place, there would be a set of moving real prices that generate an average dynamic price, giving the appearance that prices range around a fixed point, or that they converge toward it.

6.11 The concept of Pareto's optimality has no meaning under this theory framework. However, Pareto's income distribution econometrics had a key influence in developing this theory, although it is not treated here.

6.12 If proved right, theory might add some concrete constraints to dynamic models and to game-theory models about micro and macro-economics.

NOTES:

[1] United Nations, "El modelo de insumo producto", Boletín Económico para América Latina, Vol.1, num.2 (sept.1956).

[2] Barros de Castro,A and Lessa,C. "Introducción a la Economía-Un enfoque estructuralista-", Siglo XXI, 45 ed.

APENDIX I. Example of Seven Sectors IO-Nipa Open Economy - EJCh -  
Please check operations with a hand calculator to understand tables.

NOTE: IntD= Intermediate final demand ResD=Residents final demand  
ExpD=Exports final demand, TranD= Total transactions demanded

From\To	Intermediate Consumption = C =							Total Final Demand			
	Agr	Ind	Serv	Gov.	Other	Saving	Banks	IntD	ResD	ExpD	TranD
Agriculture	5	25	10	10	5	0	0	55	185	100	340
Industry	55	45	50	60	55	5	15	285	275	200	760
Services	20	85	20	30	45	5	35	240	160	125	525
Government	15	50	45	5	5	10	10	140	70	0	210
Other Rentists	5	20	15	10	5	5	0	60	170	0	230
Saving sector	0	0	0	0	0	0	155	155	15	0	170
Banks&Fin.	10	55	40	35	10	30	10	190	170	0	360
Ci=Constant C	110	280	180	150	125	55	225	1125	1045	425	2595

Total Production= 1470  
Local Transactions= 2170

Production Without Exports

	Agr	Ind	Serv	Gov.	Reals	Saver	Banks	Total
Ci	110	280	180	150	125	55	225	1125
Ti=Ci+Vi+Si	240	560	400	210	230	170	360	2170
Ai=Ti-Ci	130	280	220	60	105	115	135	1045
Vi=Variable C.	30	100	130	60	5	5	15	345
Si=Ai-Vi	100	180	90	0	100	110	120	700
Qi=Ci+Vi	140	380	310	210	130	60	240	1470

Total Production with Exports

A	B	C	D	E	F	G	H	I	
	Agr	Ind	Serv	Gov.	Reals	Saver	Banks	Total	
[1]Qi=Ci+Vi	140	380	310	210	130	60	240	1470	Q total
[2]Ei (Exports)	100	200	125	0	0	0	0	425	E total
[3]Sii=Si+Ei	200	380	215	0	100	110	120	1125	S total
[4]Tii=Qi+Sii	340	760	525	210	230	170	360	2595	T total
[5]Aii=Sii+Vi	230	480	345	60	105	115	135	1470	A total

Markup Factors:	Agr	Ind	Serv	Gov.	Reals	Saver	Banks	Total	
[6]Mrkup=Tii/Qi	2.43	2.00	1.69	1.00	1.77	2.83	1.50	1.77	Ave. Mkp
[7]Qi/Q	0.10	0.26	0.21	0.14	0.09	0.04	0.16	1.00	Zigma
[8]=[6]. [7]	0.23	0.52	0.36	0.14	0.16	0.12	0.24	1.77	Zigma=Mkp

Surplus rates	Agr	Ind	Serv	Gov.	Reals	Saver	Banks	Total	
[8] Sii/Vi	6.67	3.80	1.65	0.00	20.00	22.00	8.00	3.26	Ave. S/V
[9]=Vi/V	0.09	0.29	0.38	0.17	0.01	0.01	0.04	1.00	Zigma
[10]=[8]. [9]	0.58	1.10	0.62	0.00	0.29	0.32	0.35	3.26	Zigma=Sii/V
[11]=(2I10+1)/(I10+1)=(2*3			.26+	1)/(	3.26+	1)=...		1.77	Ave.Mkp

IvertaltOrganic Comp.	Agr	Ind	Serv	Gov.	Reals	Saver	Banks	Total	
[12]Ci/Vi	3.67	2.80	1.38	2.50	25.00	11.00	15.00	3.26	Ave. C/V
[13]=[12]. [9]	0.32	0.81	0.52	0.43	0.36	0.16	0.65	3.26	Zigma= C/V

rii=Profit rate	Agr	Ind	Serv	Gov.	RealS	Saver	Banks	Total	
[14]=[3]/[1]	1.43	1.00	0.69	0.00	0.77	1.83	0.50	0.77	rii=S/(C+V)
[15]=[14]*[7]	0.14	0.26	0.15	0.00	0.07	0.07	0.08	0.77	Zigma= rii

ri = Apparent

Internal

Profit Rate:

ri=int.prof.rte	Agr	Ind	Serv	Gov.	RealS	Saver	Banks	Total	
[16]=1-Ei/Sii	0.50	0.47	0.42	0.00	1.00	1.00	1.00	0.62	Ave E/Sii
[17]ri=rii*[16]	0.71	0.47	0.29	0.00	0.77	1.83	0.50	0.48	Ave ri
[18]=[17]*[7]	0.07	0.12	0.06	0.00	0.07	0.07	0.08	0.48	Zigma= ri

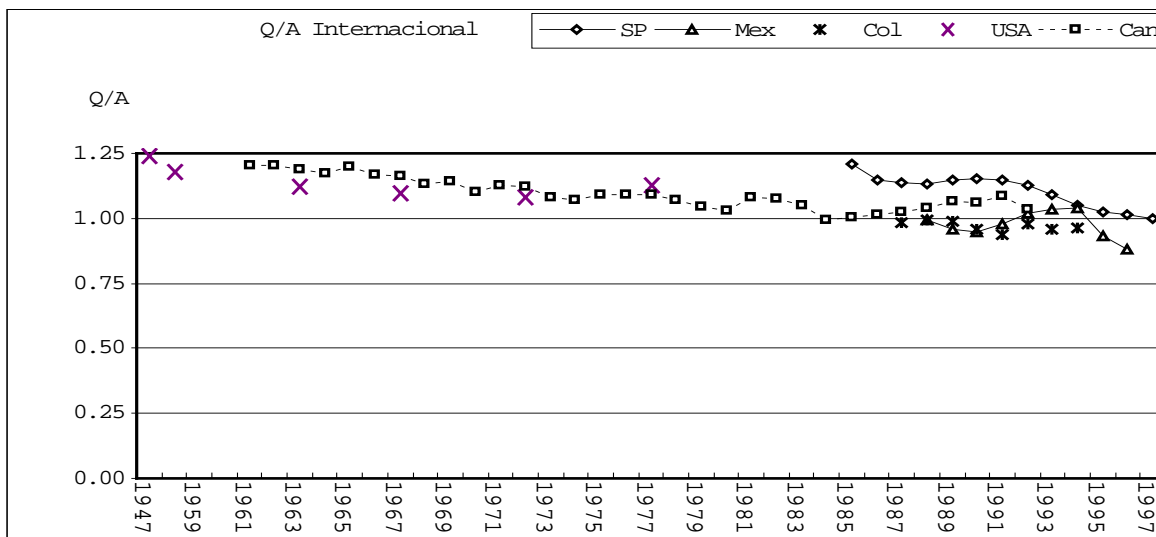
Structural      Parameters:

p=C/V=S/V	3.26							<u>Local Profit Rate</u>	
a=T/A	1.77		a=(2p+1)/(p+1)=		1.77			ri=Si/(C+V)=	0.48
<u>Total Profit Rate:</u>								<u>Export/Total S:</u>	
rii=S/(C+V)	0.77		rii=a-1=		0.77			E/Sii=	0.38
z=Q/V=A/V	4.26		z=1/(2-a)=		4.26			ri=rii*(1-E/Sii)	0.48

APENDIX II

Graphic 1. Ratio Q/A from IO-Nipas

Preliminar Statistics from United States, Mexico, Canada, Colombia, Spain.  
 Results: Q/A: Average=1.071 Standard Deviation=.0803 Sample=36 cases.



Calculated by EJCh from these sources:

US: Shaikh A., Tonak A. "Measuring the Wealth of Nations -The Political Economy of National Accounts" Cambridge U. Press, 1996.

INTERNET: BEA Webpage. 1999

Canada: Statistics Canada, "The Input-Output Structure of the Canadian Economy, 1961-1992, Historically Revised Data", Catalogue 15-201-XPB, Minister of Industry, 1998.

Colombia: DANE, Departamento Administrativo Nacional de Estadística, "Colombia Estadística 92", "Matrices Insumo Producto 1990-1994, Cuentas Nacionales 1987-1995 DANE"

Mexico: INTERNET: INEGI. Sistema de Cuentas Nacionales de México. Webpage. 1999

Spain: INTERNET: Banco Nacional de España. Webpage. 1999



**APENDIX III Cash flows in a 2 Sectors Closed Economy - Argumentation for A=Q or S=C premises.**

- Assumptions:
1. Each sector produces intermediate consumption of the other one. ..
  2. Workers and firm owners of each sector buy final goods of its sector. ..
  3. Once final production is sold, people exchanges them with the other sector to get a better proportion, according to each one income and preferences.
- So, we avoid price and real production determination for both sectors.

N	Description	People				Firms				Total			
		Workers		Owners		Sector 1		Sector 2			Net		
		+	-	Net	+	-	Net	+	-			Net	
Start of period, firms have cash and intermediate product to sell.													
0	Cash at hand		0		0			C1+V1		C+V-C1-V1	C+V		
1	Wage payment	V		V			0	V1	C1	V-V1	C-C1	C+V	
2a	Firms buy C, constant		V				0	C1	0	C1		C	C+V
2b	capital			V			0	C-C1		C-C1		C1	C+V
3a	Owners		V		C-C1		C-C1	C-C1	0			C1	C+V
3b	transfer		V		C1		C		0		C1	0	C+V

- 4 Work added to constant capital is converted into final products and intermediate products (capital) to replace spent ones.
- Sells of final goods and services start. Intermediate products stored for next period.

5	Workers buy		V		0		C	V1	V1	V-V1		V -V1	C+V
6a	Owners buy					C-C1	C1		V1	C-C1		C+V-C1-V1	C+V
6b						C1	0	C1	V1+C1			C+V-C1-V1	C+V

- End of period: people has satisfied their needs according to their income, economy has recovered the initial conditions of step-zero, to repeat the process.
- Next, period analysis of aggregated flows:

N	Description	People				Firms				Total				
		Workers		Owners		Sector 1		Sector 2			Final			
		+	-	Net	+	-	Net	+	-			Net		
7	Subtotals	V	V	0	C	C	0	C+V1	C+V1	0	V+C-V1	V+C-V1	0	Net
8	Income T							C+V1			V+C-V1			T=2C+V
9	Costs Q without 3								V1+C1		V-V1+ C-C1			Q=V+C
10	Surplus S									C-C1			C1	S=C
11	A=ValueAdded	V			C									A=V+C

Conclusions:

1. Currency is distributed always at the begining of period.
2. Same currency that pays costs, flows later to people to buy final products.
3. Production consumes and replaces intermediate products, and makes final products
4. At the end, each sector has its inventories and its currency to restart.
5. Added-Value=Total Production Cost A=Q, so Surplus=Intermediate consumption, S=C.